

REMARKS

In order to more particularly point out and distinctly claim the subject matter which Applicants regard as the invention, Claim 20 has been amended to state that silica powder is fed to the rotatable furnace such that the silica powder drops around the center of a furnace bed and the rotatable furnace through the feeder. Newly presented Claims 26 and 27 are directed to particular embodiments of the present invention. Support for newly presented Claim 26 can be found in Figure 1 and support for newly presented Claim 27 can be found in the first paragraph on page 12 of the "clean" copy of the substitute specification.

Claims 20-25 have been rejected under 35 USC 103(a) as being unpatentable over Sayce et al in view of Komine et al. Applicants respectfully traverse this ground of rejection and urge reconsideration in light of the following comments.

The presently claimed invention is directed to a method of manufacturing a quartz glass slab ingot which comprises the steps of providing a rotatable furnace having a feeder at a top portion thereof and a burner, feeding silica powder to the rotatable furnace such that the silica powder drops around the center of a furnace bed in the rotatable furnace through the feeder, fusing the silica powder in the rotatable furnace, depositing the fused silica at the center of the furnace bed and extending the fused silica deposit outwardly from the center of the furnace bed by heating and rotating the furnace, wherein gas supplied to the burner has a hydrogen/oxygen gas ratio of from 2.1 to 2.5.

As explained previously, the instant invention enables the manufacture of a quartz slab ingot which can be in the form of a column, a solid round bar or a plate. In the present invention, an oxygen-hydrogen flame method is used to manufacture quartz glass in the claimed shape which contains about 200 parts per million of hydroxide. In the prior art methods, silica powder is not supplied to the center of the

furnace but through several distributing channels with a carrier gas which makes it possible to supply a large amount of silica into the furnace and enlarge the scale of the product quartz glass ingot. The present inventors discovered that the flow of silica powder tends to interfere with the flow of hydrogen gas and, if the diameter of the quartz glass ingot exceeds 400 mm, the supply rate of silica powder is increased, which makes the hydrogen gas flow turbulent and prevents the uniform dispersion of the silica powder in the oxygen-hydrogen gas mixture. As a result, the silica powder is not uniformly fused and bubbles are generated inside the fused quartz glass, which damages the quality of the quartz glass. The instant invention allows for the manufacture of a large quartz glass ingot directly through the fusion of silica powder without the necessity of fusing a column ingot with secondary heating. The prior art cited by the Examiner does not disclose the presently claimed invention.

The Sayce et al reference discloses a method and apparatus for manufacturing synthetic vitreous silica ingots by producing a melt of synthetic vitreous silica in a crucible within a refractory furnace and continuously withdrawing an ingot through an orifice in the wall of the furnace. In Sayce et al, an organic silicon compound is fed as a precursor material through a burner. If synthetic vitreous silica is used as the precursor material, it is supplied directly to the crucible in the form of powder, crystal or amorphous grain, rather than being deposited there by a synthesis burner. That is, this reference has no disclosure with respect to feeding silica powder through a feeder at a top portion of the furnace such that the silica powder drops around the center of a furnace bed contained in the rotatable furnace. When the burner is used to introduce a precursor silica compound into the furnace, the precursor material is an organic silicon compound in the form of a gas or vapor. In contrast to the Examiner's statement in the Office Action, this reference has no disclosure of silica powder being introduced into the

furnace via the synthesis burners 53. Moreover, as pointed out by the Examiner, this reference contains no disclosure with respect to the hydrogen to oxygen gas ratio being supplied to the burners. Therefore, the secondary Komine et al reference must provide the motivation to one of ordinary skill in the art to modify the primary Sayce et al reference in a manner to yield the presently claimed invention. It is respectfully submitted that the Komine et al reference contains no such disclosure.

The Komine et al reference discloses an optical member made of silica glass manufactured by the direct method where a material gas containing an organo-silicon compound is allowed to react in an oxidizing flame. The Komine reference has been cited by the Examiner as suggesting the use of an oxygen to hydrogen gas supply of 0.48 or more. However, this reference is concerned with a vapor phase reaction to produce a silica powder from an organo-silicon compound while the presently claimed invention requires silica powder to be directly fed into the furnace. Therefore, for this reference to be properly combinable with the primary Sayce et al reference, the common processes in both references would be the feeding of an organo-silicon compound to the furnace in the form of a gas or a vapor. However, the present invention is concerned with a method of manufacturing fused silica by melting silica powder which is fed to the furnace and not synthesized therein. The oxygen to hydrogen ratio recited in Komine et al is concerned with the burning of the organo-silicon vapor or gas compound. In the present invention, there is no such concern and, as such, it is respectfully submitted that the presently claimed invention is patentably distinguishable over the combination of Komine et al with Sayce et al.

The Examiner is respectfully requested to reconsider the present application and to pass it to issue.

Also enclosed herewith is a certified copy of the foreign priority document for the present application.

Respectfully submitted,


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